Monthly Environmental Monitoring Report

Yancoal Mount Thorley Warkworth

October 2022

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Revision History

Version No.	Version Details	Document Status	Date
1.0	**Environment and Community Advisor**	**Final**	**09/02/2023**

1.0 INTRODUCTION

This report has been compiled to provide a monthly summary of environmental monitoring results for Mount Thorley Warkworth (MTW). This report includes all monitoring data collected for the period 1 October to 31 October 2022.

2.0 AIR QUALITY

2.1 Meteorological Monitoring

Meteorological data is collected at MTW's 'Charlton Ridge' meteorological station (refer to **Figure 3**: Air Quality Monitoring Locations).

2.1.1 Rainfall

Rainfall for the reporting period is summarised in **Table 1**. The year-to-date monthly rainfall totals, 2022 monthly rainfall totals and historical average monthly rainfall trend are shown in **Figure 1**.

Table 1: Monthly Rainfall MTW

2022	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
October	123.6	996.8

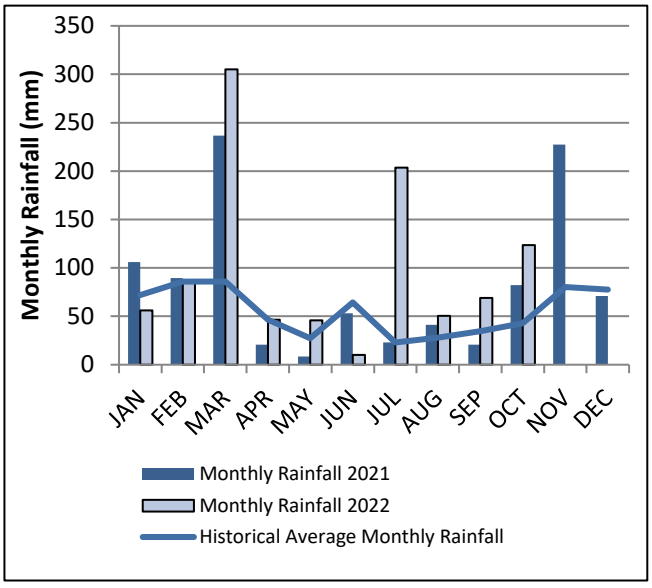

Figure 1: Rainfall Trend YTD

Note: The historical average monthly rainfall is calculated from 2007 to 2021 monthly totals.

2.1.2 Wind Speed and Direction

Winds from the South, Southeast and Northwest were dominant during the reporting period as shown in **Figure 2.**

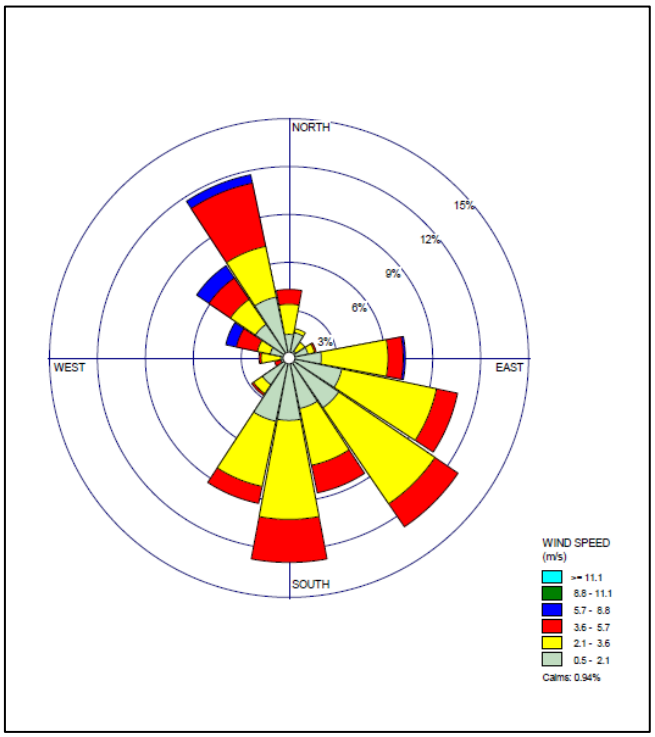

Figure 2: Charlton Ridge Wind Rose – October 2022

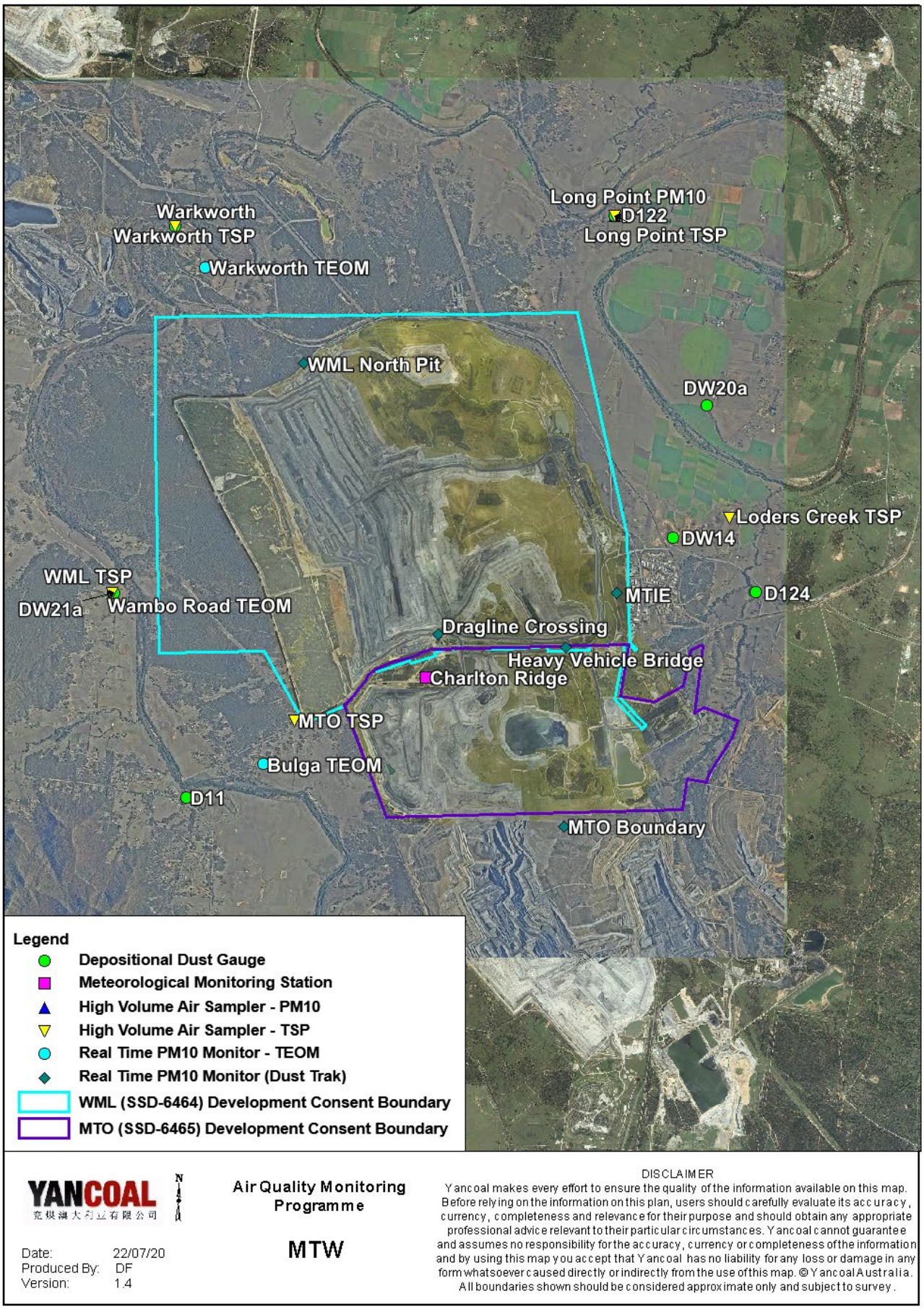

Figure 3: Air Quality Monitoring Locations

2.2 Depositional Dust

To monitor air quality, MTW operates and maintains a network of seven depositional dust gauges, situated on private and mine owned land surrounding MTW.

Figure 4 displays insoluble solids results from depositional dust gauges during the reporting period compared against the year-to-date average and the annual impact assessment criteria.

An annual assessment of MTW's compliance with the Long-Term Impact Assessment Criteria will be provided in the 2022 Annual Review Report.

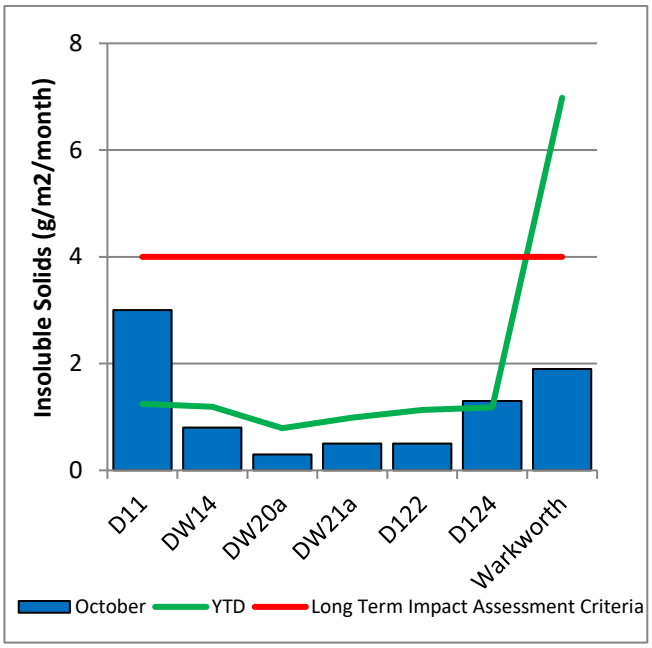

Figure 4: Depositional Dust – October 2022

2.3 Suspended Particulates

Suspended particulates are measured by a network of High Volume Air Samplers (HVAS) measuring Total Suspended Particulates (TSP) and Particulate Matter <10µm (PM_{10}). The location of these monitors can be found in **Figure 3**. Each HVAS was run for 24 hours on a six-day cycle in accordance with EPA requirements.

2.3.1 HVAS PM_{10} Results

Figure 5 shows the individual PM_{10} results at each monitoring station against the short-term impact assessment criteria of 50µg/m³.

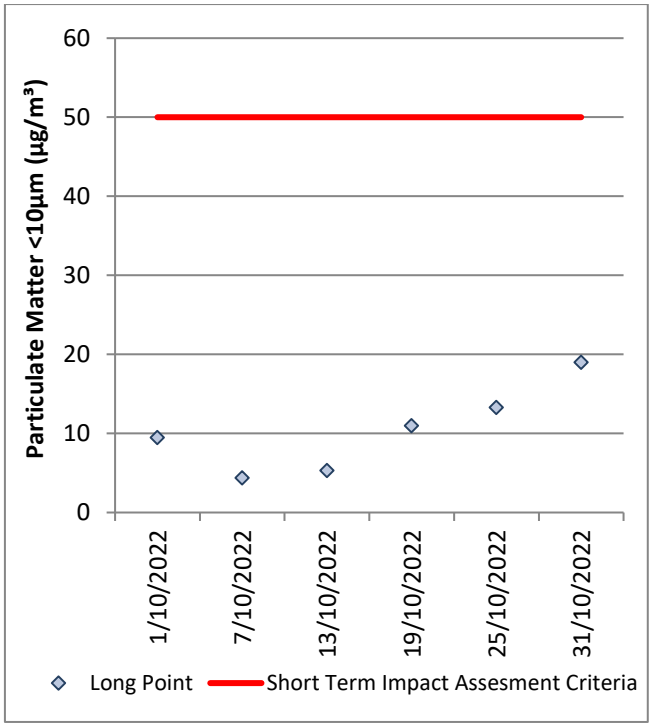

Figure 5: Individual PM10 Results – October 2022

Figure 6 shows the annual average PM10 result against the long term impact assessment criteria.

An assessment of MTW's compliance with the Long-Term Impact Assessment Criteria will be provided in the 2022 Annual Review Report.

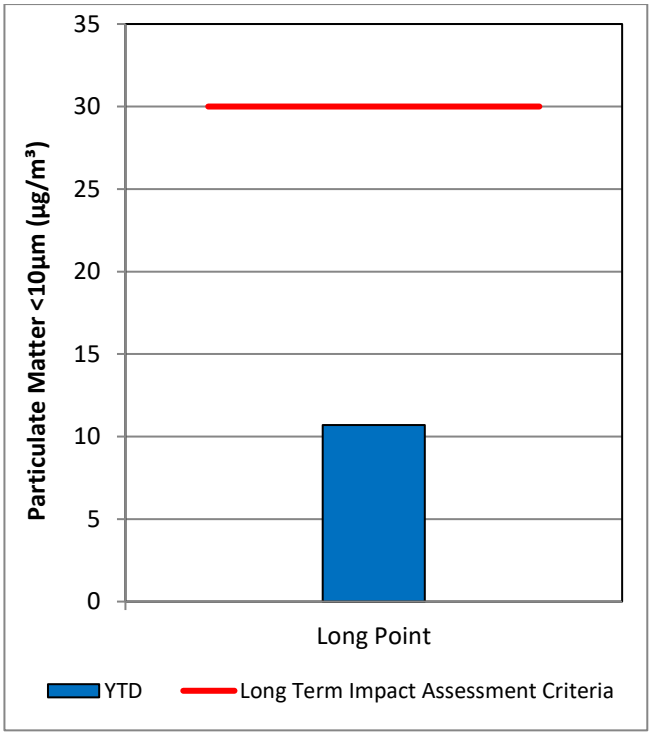

Figure 6: Annual Average PM_{10} – October 2022

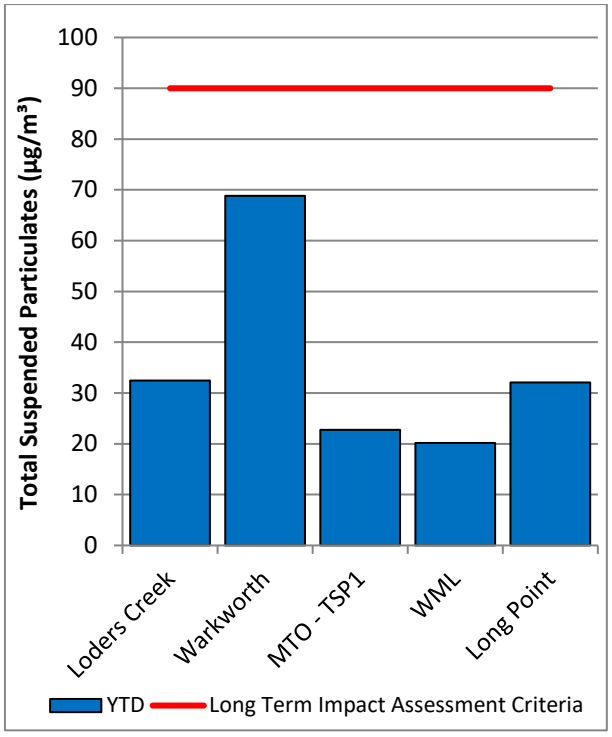

Figure 7: Annual Average Total Suspended Particulates – October 2022

2.3.2 TSP Results

Figure 7 shows the annual average TSP results compared against the long-term impact assessment criteria of 90µg/m³.

An assessment of MTW's compliance with the Long-Term Impact Assessment Criteria will be provided in the 2022 Annual Review Report.

2.3.3 Real Time PM_{10} Results

MTW maintains a network of real time PM_{10} monitors. The real time air quality monitoring stations continuously log information and transmit data to a central database, generating internal alerts when particulate matter levels exceed internal trigger limits.

Results for real time dust sampling are shown in **Figure 8**, including the daily 24-hour average PM_{10} result and the annual PM_{10} average.

Data was not available on 24 October 2022 from the Warkworth Monitor due to equipment issues.

2.3.4 Real Time Alarms for Air Quality

During October, the real time monitoring system generated 26 automated air quality related alerts, including 15 alerts for adverse meteorological conditions and 10 alerts for elevated PM_{10} levels.

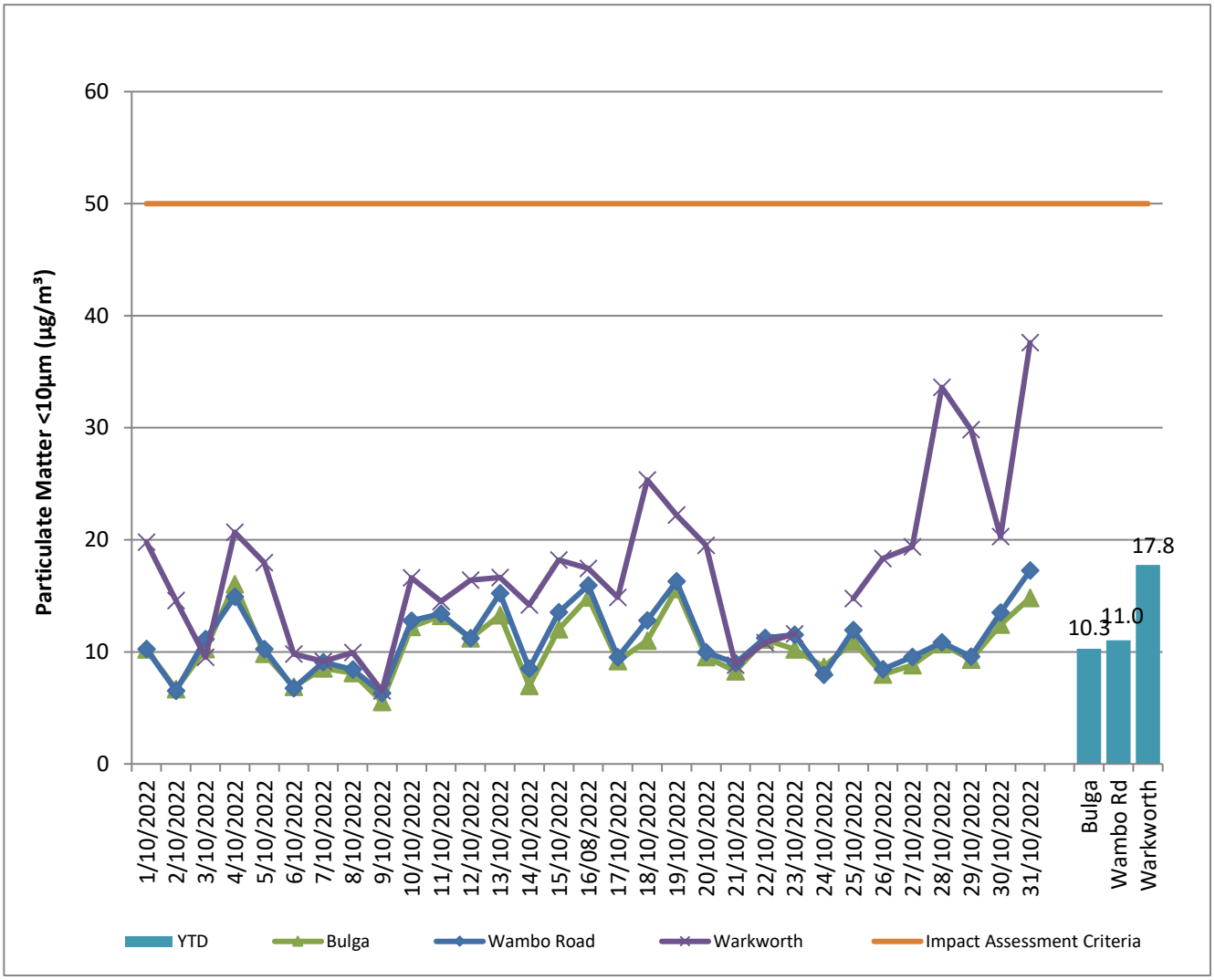

Figure 8: Real Time PM_{10} daily 24hr average (line graphs) and YTD annual average (column graphs) – October 2022

3.0 WATER QUALITY

MTW maintains a network of surface water and groundwater monitoring sites.

3.1 Surface Water

Monitoring is conducted at mine site dams and surrounding natural watercourses.

Surface water courses are sampled on a monthly or quarterly sampling regime. Water quality is evaluated through the parameters of pH, Electrical Conductivity (EC) and Total Suspended Solids (TSS). The Hunter River and the Wollombi Brook are sampled both upstream and downstream of mining operations, to record background water quality and to monitor the potential impact of mining on the river system. Other Hunter River tributaries are also monitored.

Results of monitoring are reported quarterly, next available in the December 2022 report.

3.2 HRSTS Discharge

MTW participates in the Hunter River Salinity Trading Scheme (HRSTS), allowing discharge from licensed discharge points located at Dam 1N and Dam 9S. Discharges can only take place subject to HRSTS regulations.

During the reporting period, licenced HRSTS discharge from Dam 9S (EPL 1976 Point 4) occurred on the 18th of October and from the 25th to 27th of October, discharging a total of 145 ML.

3.3 Groundwater Monitoring

Groundwater monitoring is undertaken on a quarterly basis in accordance with the MTW Groundwater Monitoring Programme.

Groundwater results are reported quarterly, next available in the December 2022 report.

4.0 BLAST MONITORING

MTW have a network of six blast monitoring units. These are located at nearby privately owned residences and function as regulatory compliance monitors.

The location of these monitors can be found in **Figure 15**.

4.1 Blast Monitoring Results

During October 2022, 18 blasts were initiated at MTW. **Figure 9** to **Figure 14** show the blast monitoring results for the reporting period against the impact assessment criteria. The criteria are summarised in **Table 2**.

Table 2: Blasting Limits

Airblast Overpressure (dB(L))	Comments
115	5% of the total number of blasts in a 12 month period at WML or MTO
120	0%
Ground Vibration (mm/s)	**Comments**
5	5% of the total number of blasts in a 12 month period at WML or MTO
10	0%

During the reporting period no blast exceeded the 115dB(L) threshold for air blast overpressure and no blast exceeded the 5mm/s criteria for ground vibration.

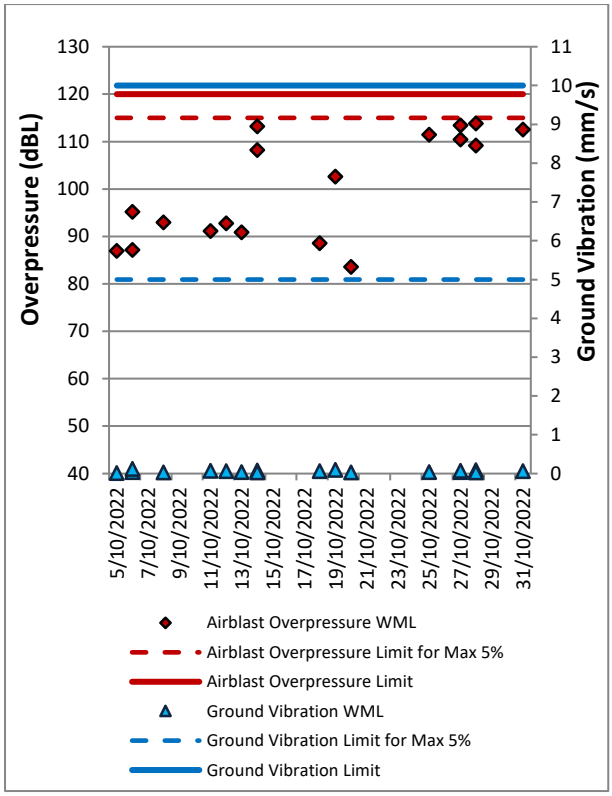

Figure 9: Abbey Green Blast Monitoring Results – October 2022

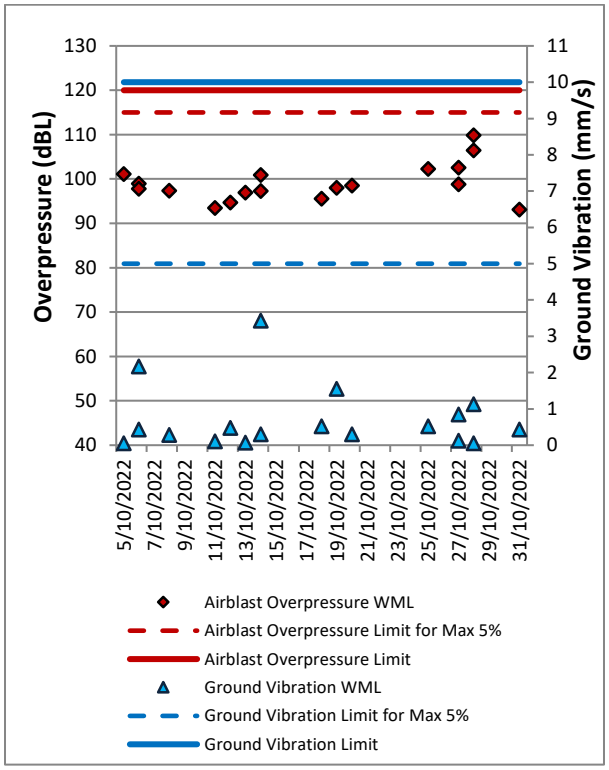

Figure 10: Bulga Village Blast Monitoring Results – October 2022

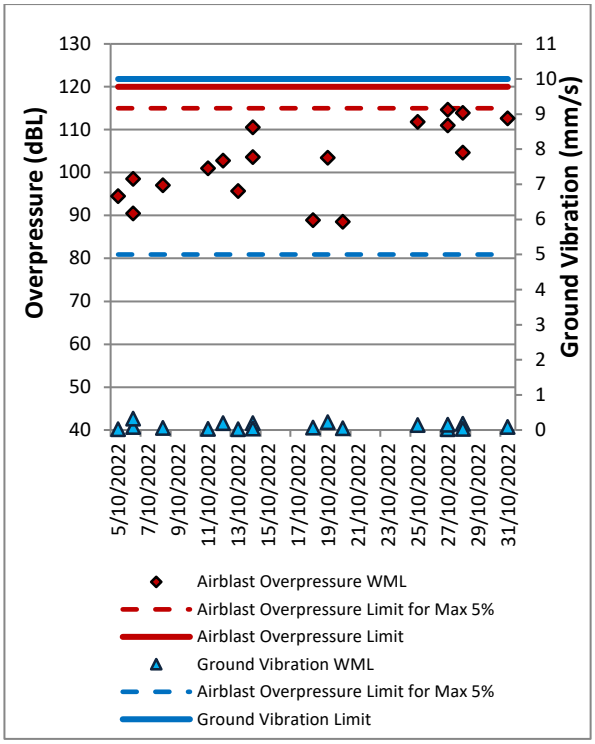

Figure 11: MTIE Blast Monitoring Results – October 2022

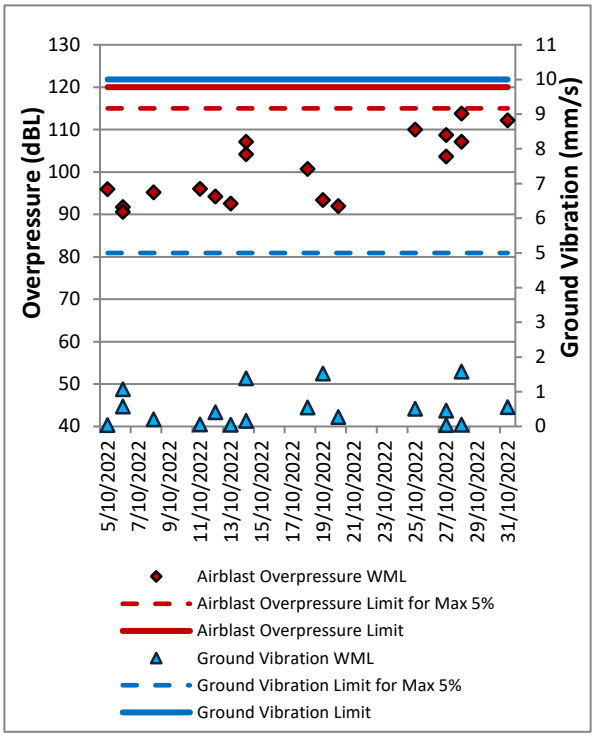

Figure 12: Wollemi Peak Road Blast Monitoring Results – October 2022

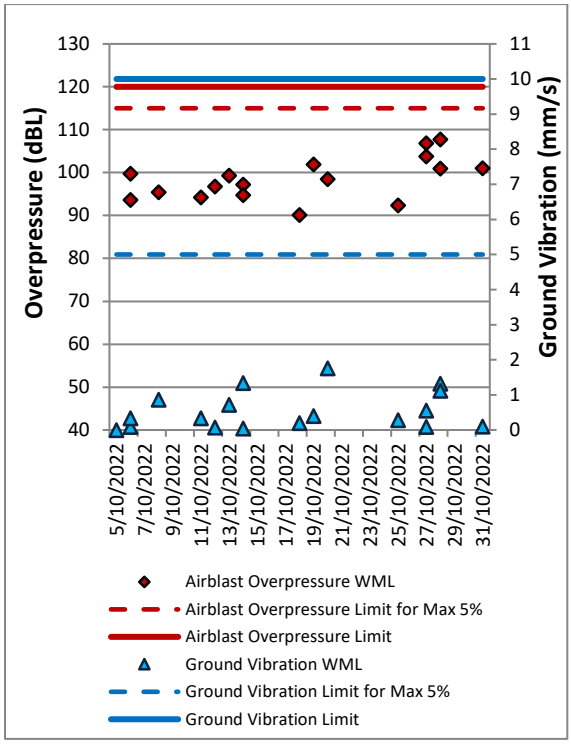

Figure 13: Wambo Road Blast Monitoring Results – October 2022

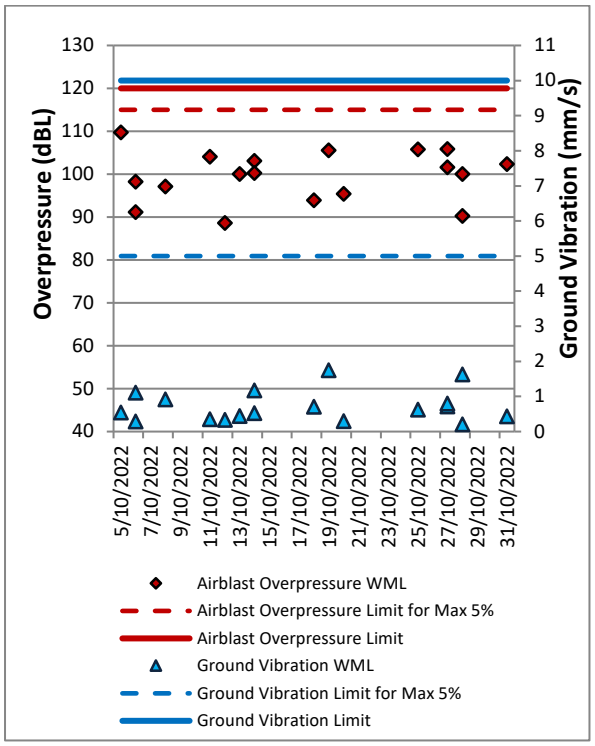

Figure 14: Warkworth Blast Monitoring Results – October 2022

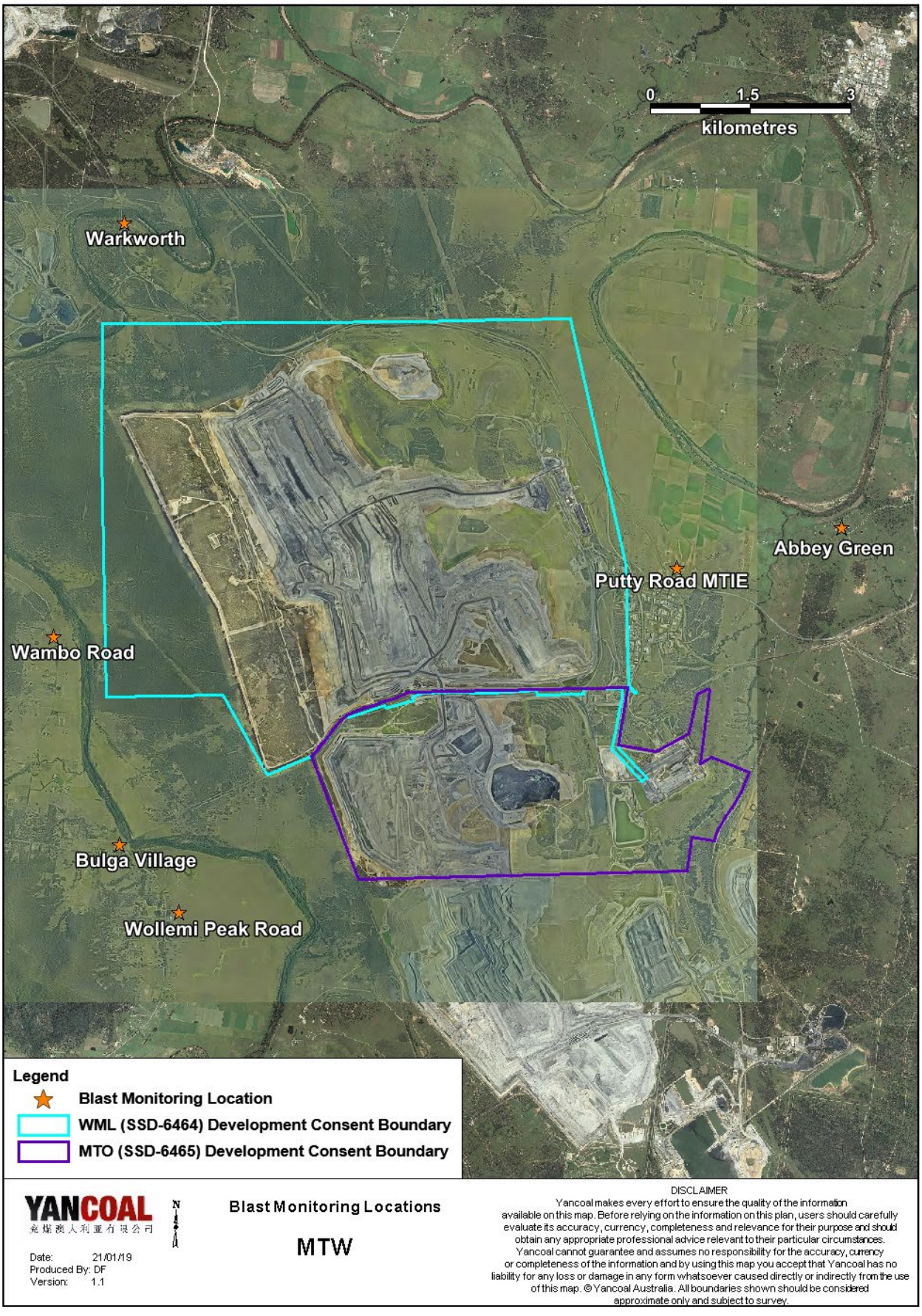

Figure 15: MTW Blast Monitoring Location Plan

5.0 NOISE

Routine attended noise monitoring is carried out in accordance with the MTW Noise Management Plan. A review against EIS predictions will be reported in the Annual Review. The purpose of the noise surveys is to quantify and describe the acoustic environment around the site and compare results with specified limits. Real time noise monitoring also occurs at five sites surrounding MTW. Noise monitoring locations are displayed in **Figure 16**.

5.1 Attended Noise Monitoring Results

Attended monitoring was conducted at receiver locations surrounding MTW on the night of 19 October 2022. Measurements complied with the relevant criteria.

5.1.1 WML Noise Assessment

Compliance assessments undertaken against the WML noise criteria are presented in **Tables 3** and **4**.

Table 3: $L_{Aeq,\ 15\ minute}$ Warkworth Impact Assessment Criteria – October 2022

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies?[1]	WML L_{Aeq} dB[2,3]	Exceedance[3,4]
Bulga RFS	19/10/2022 23:46	3.2	D	37	No	IA	NA
Bulga Village	19/10/2022 23:03	2.6	D	38	Yes	37	Nil
Gouldsville	19/10/2022 21:29	2.5	E	38	Yes	31	Nil
Inlet Rd	19/10/2022 22:13	2.3	F	37	No	<25	NA
Inlet Rd West	19/10/2022 21:50	2.4	D	35	Yes	NM	Nil
Long Point	19/10/2022 21:01	2.5	F	35	No	IA	NA
South Bulga	20/10/2022 0:35	2.5	D	35	Yes	IA	Nil
Wambo Road	19/10/2022 22:41	2.5	D	38	Yes	38	Nil

Notes:
1. Noise criteria apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;
2. Site-only LAeq,15minute attributed to WML, including modifying factors if applicable;
3. Bold results in red indicate exceedance of relevant criterion; and
4. NA in exceedance column means atmospheric conditions outside conditions specified in consent, therefore criterion was not applicable.

Table 4: $L_{A1,\ 1\ minute}$ Warkworth - Impact Assessment Criteria – October 2022

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies?[1]	WML $L_{A1,\ 1min}$ dB[2,3]	Exceedance[3,4]
Bulga RFS	19/10/2022 23:46	3.2	D	47	No	IA	NA
Bulga Village	19/10/2022 23:03	2.6	D	48	Yes	40	Nil
Gouldsville	19/10/2022 21:29	2.5	E	48	Yes	34	Nil
Inlet Rd	19/10/2022 22:13	2.3	F	47	No	35	NA
Inlet Rd West	19/10/2022 21:50	2.4	D	45	Yes	NM	Nil
Long Point	19/10/2022 21:01	2.5	F	45	No	IA	NA
South Bulga	20/10/2022 0:35	2.5	D	45	Yes	IA	Nil
Wambo Road	19/10/2022 22:41	2.5	D	48	Yes	39	Nil

Notes:
1. Noise criteria apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;
2. Site-only LA1,1minute attributed to WML;
3. Bold results in red indicate exceedance of relevant criterion; and
4. NA in exceedance column means atmospheric conditions outside conditions specified in consent, therefore criterion was not applicable.

5.1.2 MTO Noise Assessment

Compliance assessments undertaken against the MTO noise criteria are presented in **Table 5** and **6**.

Table 5: $L_{Aeq, 15minute}$ Mount Thorley - Impact Assessment Criteria – October 2022

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO L_{Aeq} dB[2,3]	Exceedance[3,4]
Bulga RFS	19/10/2022 23:46	3.2	D	37	No	33	NA
Bulga Village	19/10/2022 23:03	2.6	D	38	Yes	IA	Nil
Gouldsville	19/10/2022 21:29	2.5	E	35	Yes	IA	Nil
Inlet Rd	19/10/2022 22:13	2.3	F	37	No	35	NA
Inlet Rd West	19/10/2022 21:50	2.4	D	35	Yes	31	Nil
Long Point	19/10/2022 21:01	2.5	F	35	No	IA	NA
South Bulga	20/10/2022 0:35	2.5	D	36	Yes	28	Nil
Wambo Road	19/10/2022 22:41	2.5	D	38	Yes	IA	Nil

Notes:
1. Noise criteria apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;
2. Site-only LAeq,15minute attributed to MTO, including modifying factors if applicable;
3. Bold results in red indicate exceedance of relevant criterion; and
4. NA in exceedance column means atmospheric conditions outside conditions specified in consent, therefore criterion was not applicable.

Table 6: $L_{A1, 1Minute}$ Mount Thorley - Impact Assessment Criteria – October 2022

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO $L_{A1, 1min}$ dB[2,3]	Exceedance[3,4]
Bulga RFS	19/10/2022 23:46	3.2	D	47	No	35	NA
Bulga Village	19/10/2022 23:03	2.6	D	48	Yes	IA	Nil
Gouldsville	19/10/2022 21:29	2.5	E	45	Yes	IA	Nil
Inlet Rd	19/10/2022 22:13	2.3	F	47	No	37	NA
Inlet Rd West	19/10/2022 21:50	2.4	D	45	Yes	37	Nil
Long Point	19/10/2022 21:01	2.5	F	45	No	IA	NA
South Bulga	20/10/2022 0:35	2.5	D	46	Yes	30	Nil
Wambo Road	19/10/2022 22:41	2.5	D	48	Yes	IA	Nil

Notes:
1. Noise criteria apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;
2. Site-only LA1,1minute attributed to MTO;
3. Bold results in red indicate exceedance of relevant criterion; and
4. NA in exceedance column means atmospheric conditions outside conditions specified in consent, therefore criterion was not applicable.

5.1.3 NPfI Low Frequency Assessment

In accordance with the requirements of the EPA's Noise Policy for Industry (NPfI), the applicability of the low frequency modification factor corrections has been assessed. This resulted in the application of a 2dB penalty to the site only LAeq for the measurements taken at Bulga Village and Wambo Road on 19 October 2022. Resulting LAeq noise levels did not exceed the WML impact assessment criteria at Bulga Village or Wambo Road.

The WML assessment for low frequency noise is shown in **Table 7** and the MTO assessment for low frequency noise is shown in **Table 8**.

Table 7: Warkworth Low Frequency Noise Assessment – October 2022

Location	Date and Time	Measured WML LAeq dB	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality [1]	Low-frequency Modifying Factor?	Maximum Exceedance of Reference Spectrum [1,2]	Penalty dB [2]	Exceedance
Bulga RFS	19/10/2022 23:46	IA	No	No	No	NA	No	NA	Nil	Nil
Bulga Village	19/10/2022 23:03	35	Yes	No	No	NA	Yes	**0.9 dB @ 80Hz**	**2**	Nil
Gouldsville	19/10/2022 21:29	31	Yes	No	No	NA	No	NA	Nil	Nil
Inlet Rd	19/10/2022 22:13	<25	No	No	No	NA	No	NA	Nil	Nil
Inlet Rd West	19/10/2022 21:50	NM	Yes	No	No	NA	No	NA	Nil	Nil
Long Point	19/10/2022 21:01	IA	No	No	No	NA	No	NA	Nil	Nil
South Bulga	20/10/2022 0:35	IA	Yes	No	No	NA	No	NA	Nil	Nil
Wambo Road	19/10/2022 22:41	36	Yes	No	No	NA	Yes	**0.3 dB @ 80Hz**	**2**	Nil

Notes:
1. NA denotes 'not applicable'; and
2. Bold results indicate that application of NPfI modifying factor/s is required.

Table 8: Mount Thorley Operations Low Frequency Noise Assessment – October 2022

Location	Date and Time	Measured WML LAeq dB	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[1]	Low-frequency Modifying Factor?	Maximum Exceedance of Reference Spectrum [1,2]	Penalty dB[2]	Exceedance [2]
Bulga RFS	19/10/2022 23:46	33	No	No	No	NA	No	NA	Nil	Nil
Bulga Village	19/10/2022 23:03	IA	Yes	No	No	NA	No	NA	Nil	Nil
Gouldsville	19/10/2022 21:29	IA	Yes	No	No	NA	No	NA	Nil	Nil
Inlet Rd	19/10/2022 22:13	35	No	No	No	NA	No	NA	Nil	Nil
Inlet Rd West	19/10/2022 21:50	31	Yes	No	No	NA	No	NA	Nil	Nil
Long Point	19/10/2022 21:01	IA	No	No	No	NA	No	NA	Nil	Nil
South Bulga	20/10/2022 0:35	28	Yes	No	No	NA	No	NA	Nil	Nil
Wambo Road	19/10/2022 22:41	IA	Yes	No	No	NA	No	NA	Nil	Nil

Notes:
1. NA denotes 'not applicable'; and
2. Bold results indicate that application of NPfI modifying factor/s is required.

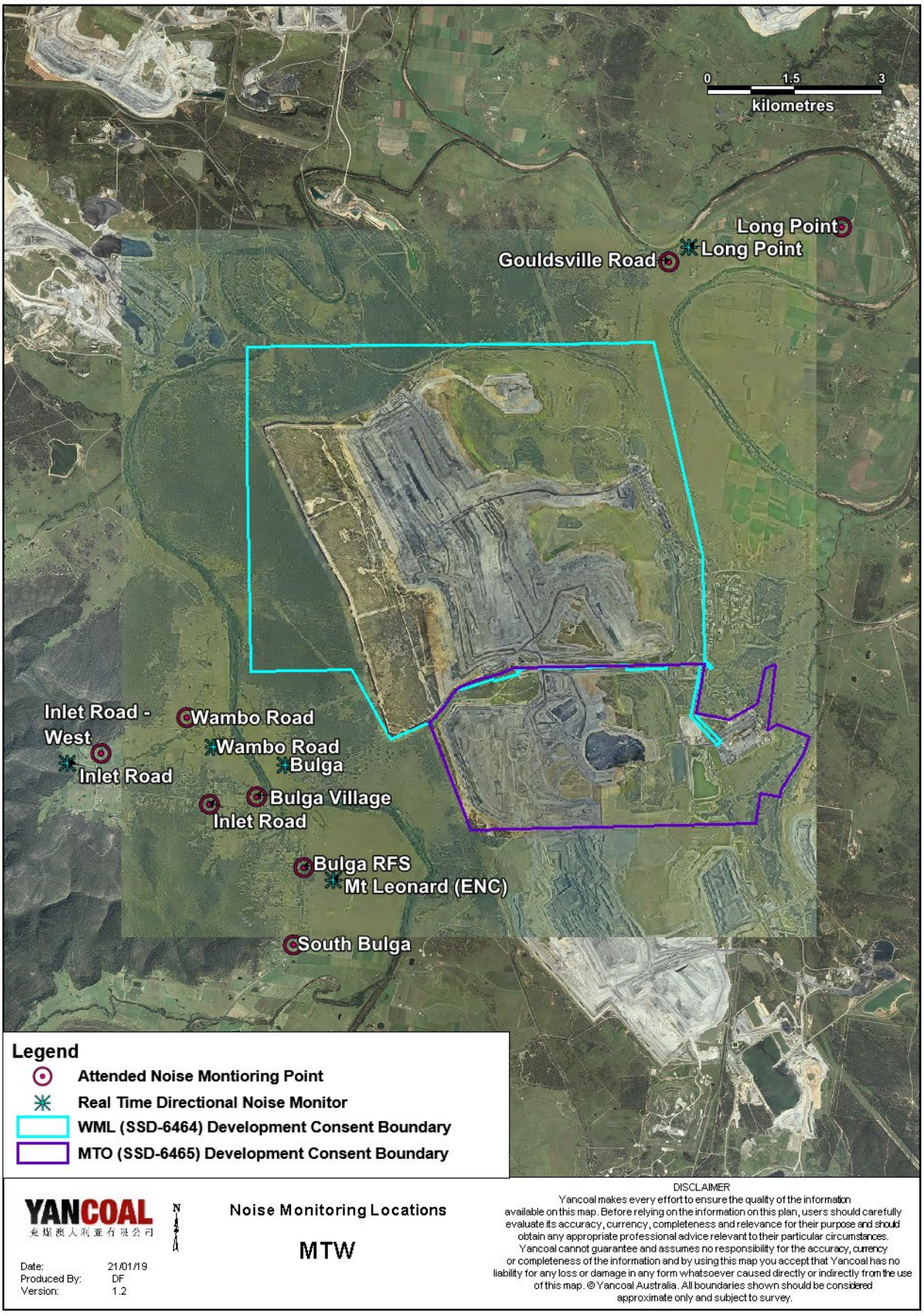

Figure 16: Noise Monitoring Location Plan

5.2 Noise Management Measures

A program of targeted supplementary attended noise monitoring is in place at MTW, supported by the real-time directional monitoring network and ensuring the highest level of noise management is maintained. The supplementary program is undertaken by MTW personnel and involves:

- Routine inspections from both inside and outside the mine boundary;
- Routine and as-required handheld noise assessments (undertaken in response to noise alarm and/or community complaint), comparing measured levels against consent noise limits; and
- Validation monitoring following operational modifications to assess the adequacy of the modifications.

Where a noise assessment identifies noise emissions which are exceeding the relevant noise limit(s) for any particular residence, modifications will be made to ensure that the noise event is resolved within 75 minutes of identification. The actions taken are commensurate with the nature and severity of the noise event, but can include:

- Changing the haul route to a less noise sensitive haul;
- Changing dump locations (in-pit or less exposed dump option);
- Reducing equipment numbers;
- Shut down of task; or
- Site shut down.

A summary of these assessments undertaken during October are provided in **Table 9**.

Table 9: Supplementary Attended Noise Monitoring Data – October 2022

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
658	14	6	2.13

Note: Measurements are taken under all meteorological conditions, including conditions under which the consent noise criteria do not apply.

6.0 OPERATIONAL DOWNTIME

During October, a total of 1188 hours of equipment downtime was logged in response to environmental events such as dust, noise and adverse meteorological conditions. Operational downtime by equipment type is shown in **Figure 17**.

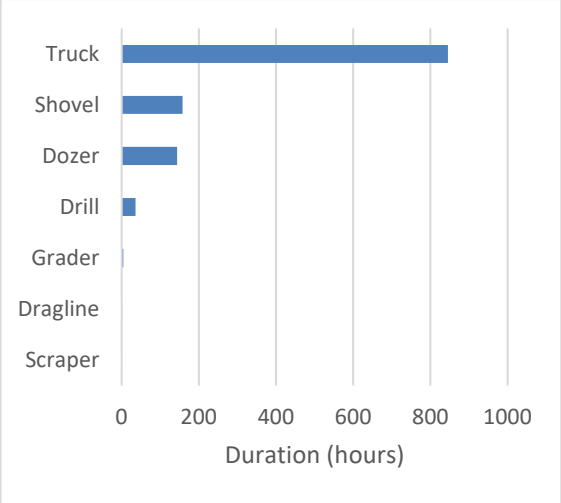

Figure 17: Operational Downtime by Equipment Type – October 2022

7.0 REHABILITATION

During October 2022, 2.4 Ha of land was released, and 3.13 Ha was bulk shaped.

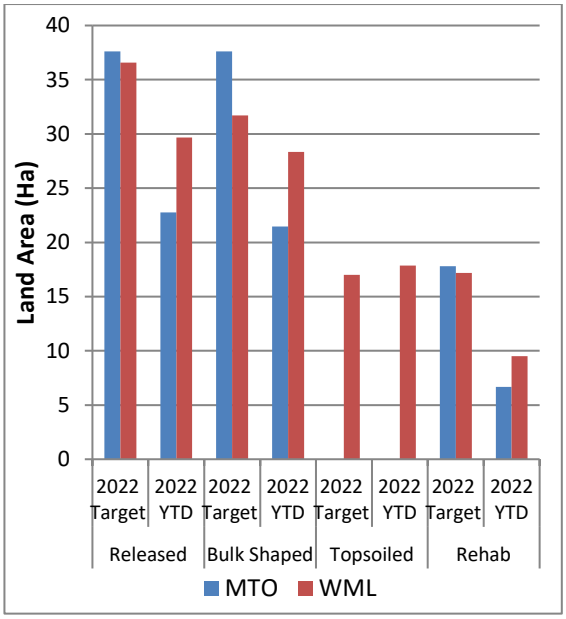

Figure 18: Rehabilitation YTD – October 2022

8.0 ENVIRONMENTAL INCIDENTS

There was one environmental incident recorded during the reporting period.

On 8 October 2022, one sediment dam overtopped its spillway due to a significant rain event. Rainfall started at approximately 2:40pm on Friday 7 March 2022 and continued in repeated rainfall events until approximately 6:49am on Monday 9 October 2022. A total of 51.8mm of rainfall was recorded during the period. Notifications to the relevant regulatory authorities was undertaken by the MTW Environment and Community Manager in accordance with the site's Pollution Incident Response Management Plan.

9.0 COMPLAINTS

13 complaints were received during the reporting period. Details of these complaints are shown in **Table 10** below.

Table 10: Complaints Summary YTD

	Noise	Dust	Blast	Lighting	Other	Total
January	2	1	4	0	0	7
February	8	0	5	0	1	14
March	8	0	3	0	0	11
April	1	0	7	6	0	14
May	4	0	6	1	0	11
June	0	1	4	1	0	6
July	7	0	5	0	1	13
August	3	0	5	0	0	8
September	2	0	2	2	0	6
October	7	1	3	2	0	13
November						
December						
Total	42	3	44	12	2	103

Appendix A: Meteorological Data

Table 11: Meteorological Data – Charlton Ridge Meteorological Station – October 2022

Date	Air Temperature		Relative Humidity		Wind Direction	Wind Speed	Rainfall
	Maximum (°C)	Minimum (°C)	Maximum (%)	Minimum (%)	Average (°)	Average (m/sec)	total (mm)
1/10/2022	19	4	100	49	170	3.4	0.4
2/10/2022	21	8	100	37	177	2.6	8.0
3/10/2022	21	0	100	40	159	1.8	0.2
4/10/2022	24	1	100	33	170	2.0	0.0
5/10/2022	16	8	100	77	132	3.0	12.8
6/10/2022	19	7	100	68	164	1.8	1.8
7/10/2022	18	6	100	81	194	1.0	21.8
8/10/2022	23	8	100	72	174	1.9	25.8
9/10/2022	18	4	100	50	158	3.0	4.4
10/10/2022	20	4	100	50	146	2.8	0.0
11/10/2022	21	7	89	50	114	2.7	0.0
12/10/2022	22	4	100	53	137	3.1	0.0
13/10/2022	24	6	95	41	118	2.3	0.0
14/10/2022	25	9	100	26	243	3.2	2.2
15/10/2022	24	6	91	32	202	2.1	0.0
16/10/2022	26	4	97	29	196	2.3	0.0
17/10/2022	21	8	100	57	171	3.9	1.2
18/10/2022	25	7	98	47	148	2.6	0.0
19/10/2022	23	10	100	64	184	1.9	4.8
20/10/2022	22	14	100	83	158	2.0	25.8
21/10/2022	24	10	100	61	119	1.5	2.2
22/10/2022	25	9	100	59	132	1.3	3.6
23/10/2022	26	10	100	54	148	2.5	1.2
24/10/2022	26	9	100	57	156	2.8	1.2
25/10/2022	29	9	100	44	250	2.4	0.0
26/10/2022	29	10	92	32	268	3.8	0.0
27/10/2022	28	10	92	43	272	3.0	0.0
28/10/2022	25	9	90	25	286	4.1	0.0
29/10/2022	26	7	70	25	295	4.3	0.0
30/10/2022	26	5	77	32	233	2.5	0.0
31/10/2022	30	6	100	42	236	3.5	6.2